The Tool Engineer

AMERICAN SOCIETY OF TOOL ENGINEERS

On Heald BORE-MATICS

At the top, a double end No. 49 Bore-Matic is roughing wrist pin holes on one side and finish boring on the other. The alignment is perfect. The tolerance .0002"/.0003".

Just below, the same machine is turning an aluminum piston with head end round and .025" smaller in diameter than the skirt which was tapered .0015" and elliptical .010".

At the left, a No. 47 Bore-Matic is finishing the taper bore in a valve at one station while, simultaneously, the plug is being turned to like size at the other station.

The lower view shows the Style No. 44 Bore-Matic, especially designed and built for facing and grooving. In this set-up, it is facing a steel cylinder with nine interruptions.

Complete data on request

THE HEALD MACHINE COMPANY
Worcester, Massachusetts, U. S. A.

INGERSOLL ~~ZEE~~ LOCK

Core Drills or Reamers

SOLID SHANK OR SHELL TYPE

ADJUSTABLE & RENEWABLE INSERTED BLADE BORING TOOLS

- Uses the Ingersoll Zee Lock Cutter Blade
- Positively and Rigidly Locked
- Doubly Adjustable
- Complete in Itself
- Available in All Cutting Materials
- Cutter is Reground to Size after Resetting Blades
- Eight to thirty-six Adjustments or Resizings Possible with One Set of Blades
- Initial Cost of Complete Cutter is Low
- Replacement Cost of New Set of Blades Fraction of Initial Cost

Send Data of your Boring Operations for Free Ingersoll Tool Engineering . . . write for new Ingersoll Cutter Catalog which describes the Design and Use of All Types of Inserted Blade Cutters.

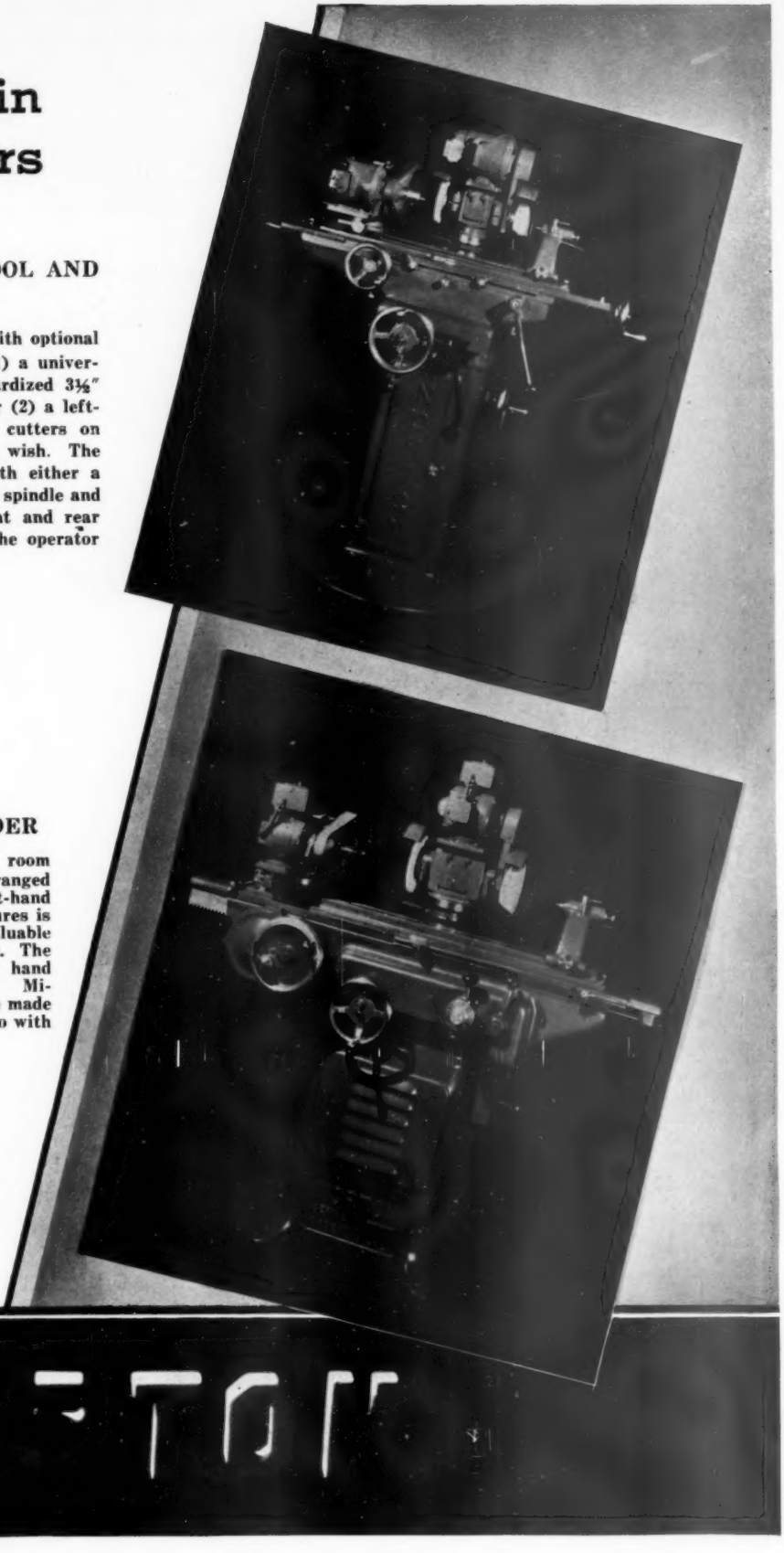
THE INGERSOLL MILLING MACHINE CO.

ROCKFORD, ILLINOIS, U. S. A.

The Latest in Tool Grinders

NO. 1 UNIVERSAL TOOL AND CUTTER

A NEW tool room grinder with optional arrangments to include (1) a universal work head having standardized 3½″ per foot and B & S tapers or (2) a left-hand footstock for grinding cutters on centers only—or both if you wish. The machine can be equipped with either a plain bronze or a ball bearing spindle and operated from both the front and rear depending on the habits of the operator and the nature of the job.



NO. 2 UNIVERSAL GRINDER

AN entirely new and larger tool room machine which also can be arranged with universal work head or left-hand footstock. One of its principal features is the hydraulic table traverse—a valuable aid in the grinding of long reamers. The saddle is operated by graduated hand wheels at both the front and rear. Micrometer setting of the table can be made by means of a two-speed apron—also with graduated hand wheel.

NORTON COMPANY
Worcester, Mass.

New York Chicago Detroit
Cleveland Hartford London

M-347A

The Tool Engineer

Trademark Registered in U.S. Pat. Off.

Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

Vol. IV. NOVEMBER, 1935 No. 7

Application blanks and information pertaining to membership in the American Society of Tool Engineers may be had by addressing *The Tool Engineer*, 2842 W. Grand Boulevard, Detroit, Michigan, or the Secretary's office, 31 Melbourne Ave. Detroit, Michigan. **Dues** are $5 initiation fee, $3 per year for senior grade membership and $2 per year for junior grade membership.

The Tool Engineer is published on the first Thursday of each month. It is the official publication of the American Society of Tool Engineers, Incorporated. The membership of the Society and readers of this publication are practical manufacturing executives such as master mechanics, works managers, tool engineers, tool designers and others who are responsible for production in hundreds of plants throughout the nation and in foreign countries.

Owing to the nature of the American Society of Tool Engineers organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

Published by
THE BRAMSON PUBLISHING CO.
2842 W. Grand Boulevard MAdison 7553 Detroit, Michigan
Roy T. Bramson, *Publisher and Editor*

Advertising Offices

Cleveland, Ohio
216 Union Bldg.
Cherry 5473

Providence, R. I.
4 Weybosset Street

Principal Features in This Issue

● **Readers of *The Tool Engineer*, not yet members of the American Society of Tool Engineers, who desire to affiliate with this rapidly growing organization may obtain full information by addressing the Secretary, 31 Melbourne, Detroit—or this publication.**

HANNIFIN VALVES....

for positive control of AIR POWER

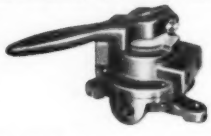
INVESTIGATE the economy and production possibilities of Hannifin Air Control Valves for providing correct operating pressures and accurate control of air-operated machinery. Hannifin Valves will provide improved operation, faster production, and an end to costly interruptions and repair expenses. They are designed for production operations, and used by the leaders of American industry. Choose from the complete range of Hannifin air control valves—the products of specialists in pneumatic and hydraulic equipment.

"PACK-LESS" AIR CONTROL VALVES

Four parts and a handle—and no packings whatever—make up the Hannifin "Pack-Less" disc type air control valve. The face of the bronze disc is ground and lapped to make a perfect seal with the seat. The simplicity and perfection of this design means reliable, accurate control. Maintenance is limited to re-lapping of the seat and disc after long service.

● STANDARD HAND CONTROL VALVES

Four-way type for control of double acting cylinders, for air pressures to 150 lbs./sq. in. or hydraulic pressures to 250 lbs./sq. in. Four standard types, 45 or 90 deg. movement. May also be used for three-way control of single acting cylinder.

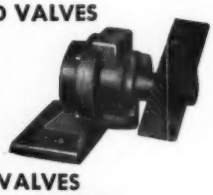


Faster PRODUCTION **HANNIFIN** MADE EASY

Hannifin Engineers, with over 26 years of specialized experience, offer authoritative advice on controls and standard and special pneumatic or hydraulic production tool equipment. Send for special valve bulletin No. 34.

● PEDAL OPERATED VALVES

With 45 deg. movement, no shut-off position. With 90 deg. movement, both outlet and exhaust closed in neutral. May be used as a throttling valve.



● SPRING RETURN VALVES

With 45 deg. movement, no shut-off position, and spring return for instant reversal of cylinder upon release of pedal.

● ROTARY TYPE VALVE

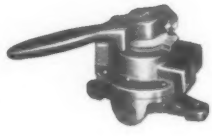
Heavy duty foot operated type. One pressure operates the cylinder, second pressure reverses the cylinder.

● MANIFOLD TYPES

Concentrates control of several cylinders and simplifies piping. Four standard types, 45 or 90 deg. movement and spring return types, for various standard cycles of control.

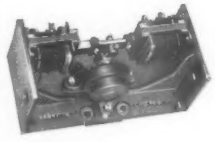
● DUPLEX TYPES

For control of two double acting cylinders, which may be operated in either direction and in any sequence desired.



● ELECTRIC TYPES

Hannifin single and double types for remote control, for time-cycle operation, for four-way control, and a wide range of standard and special applications.



● PRESSURE REGULATING VALVE

A spring loaded piston type regulating valve of high-grade bronze construction, correctly designed for accurate, sensitive automatic control. Instantly adjustable to provide the most economical working pressure for any operation.

● AIR CYLINDERS

Stationary single acting and double acting types. Improved "Leak-Proof" construction with piston seal adjustable from outside the cylinder. A style and size for every need.

HANNIFIN MANUFACTURING COMPANY

ENGINEERS • DESIGNERS • MANUFACTURERS

621-631 SOUTH KOLMAR AVENUE, CHICAGO, ILLINOIS

Pneumatic and Hydraulic Production Tool Equipment

DETROIT OFFICE: Hayward Bldg., 4829 Woodward Ave., Tel. Columbia 4949, R. A. Bean, Mgr.

NOVEMBER MEETING

(DETROIT)

NOVEMBER 14th, 1935

FORT SHELBY HOTEL (Spanish Grill)

Dinner: 6:30 p. m.

Technical Meeting: 8:00 p. m.

TWO SPEAKERS

SPEAKER: Prof. Edward W. McFarland

Professor Economics, Wayne University, Detroit

SUBJECT: "The Consumer Must Be Heard"

Professor McFarland teaches the Economics of Consumption at Wayne University. He has been Chairman of the Wayne County Consumers Council of the National Emergency Council. He has represented consumer interests on severel committees dealing with merchandising groups. He is Chairman of the Gas Investigation Committee for Detroit, appointed by Mayor Couzens. "After all," says Prof. McFarland, "the object of economic production is not the erection of skyscrapers, or the building of machinery, or railroads, nor the the amassing of money and credit." He will discuss, particularly, public and private agencies who are struggling to aid the consumer in facing his two major problems—standards and prices of commodities.

SPEAKER: Charles S. Kinnison

Hoskins Manufacturing Company, Detroit, Michigan

SUBJECT: "History and Application of Electric Heat"

Mr. Kinnison, affectionately known to a host of friends in Detroit and in many distant points as "Charley" is well known for his verses which have for many years appeared in the daily press and elsewhere. His varied accomplishments make him easy to listen to, but the major portion of his life has been devoted to the subject upon which he will address this meeting. He plans to tell us something of the early research in developing electric heat resistance materials. He will cover some of the basic patents on these materials, bringing the subject up to its present day development, particularly as applied to heat recording instruments and electric furnaces.

BRING A FRIEND OR FELLOW TOOL ENGINEER
COME EARLY TO ENJOY THE ENTERTAINMENT

PRODUCTION PERSPECTIVES

The Tool Engineer's world continues to be a busy one, with more encouraging signs every day. This humble observer has noted these "straws" or signs which may indicate to you the improvement which is becoming more and more apparent. A couple of years back we had occasion to call on a leading Detroit manufacturer—he was a leader in his line, even so conceded by his competitors. In going through this plant at that time a perfect picture of "depression" atmosphere was evident. At the time we didn't realize why the place was so "dark," but we found out the other day when we called there. Instead of windows which hadn't been washed in many months, dirty machines standing idly by, covered with caked grease and grime, unpainted walls and a few scattered "pepless" employees,—imagine our surprise to find all these things reversed. The outside of this large plant is being entirely reconditioned—the company's name and trade-mark is being repainted, windows gleam, new paint is evident. And—inside—**new machines** replacing many of the old worn out ones, orderly batteries of reconditioned or new equipment with alert people to operate them—**production going full tilt**—freshly painted side walls **in white** every corner painted with a large white circle—you know why—every department coordinated with the others—**people in a hurry—back orders, lots of them**—and, best of all—the company official telling us that **"36 will be much ahead of this we feel sure."** Boy! it makes you feel peppy. And, this is only a sample. **One large tool company and also a large broach company planning new buildings** to take care of increased business. Everywhere more "pep," more fresh paint and windows washed—it gets in your blood—**we're on our way.**

And in the meantime A.S.T.E. is forging ahead. **Many new members are being added** from all sections of the country. October 21st saw the **addition of a new chapter at Racine,** Wisconsin. A story about this will be found elsewhere in this issue. In Cleveland an organization of an A.S.T.E. Chapter is well under way. **At Wayne University** in Detroit **a junior chapter** is being considered. If this group applies for a charter soon **they will be the first college chapter of A.S.T.E.**

The Detroit area, largest single tool market in the world, is not the only busy spot on the Tool Engineer's map. **In Evansville** on October 24th a half holiday was declared to celebrate the **opening of Chrysler and Briggs plants. K. T. Keller,** Chrysler official was there, as were **D. S. Eddains,** Plymouth President, **B. E. Hutchinson,** Plymouth Chairman, railway officials and Evansville notables. The **many factories working on better hours** and with **larger forces**—as brought out in a recent survey—indicate that **Anderson, Indiana** is another busy spot. Here **Delco-Remy** is **operating five days a week, with full time for the present force. Guide Lamp,** unit of General Motors, is also working five days a week. Their **working force now totals 1750** due to **an increase of 250 employees added in September. E. C. Morrison,** Superintendent of **American Steel and Wire Mill** at Anderson reports his plant operating four and five days, with a schedule better than at this time last year. **Two buildings are being constructed** as first units of the **Greer Steel Company's new plant in North Anderson.** Men are working night and day on this work. Delco-Remy plans new expansion and personnel changes. **A new factory will be established at Bloomfield,** New Jersey, while the **Muncie,** Indiana **plant will be enlarged to a capacity of 9500** batteries per day—gain of 1000 over present output. **E. A. Mirth,** for many years with the engineering department of Delco-Remy **will be plant manager of the Bloomfield plant. A. L. Hopkins,** chief engineer of the battery plant at Muncie, is **now manager** of the **Bloomfield plant. E. E. Ward,** Muncie Assistant Factory Superintendent **becomes assistant** to Mr. Hopkins, while **C. A. Milburn** becomes chief inspector of the eastern plant. **Richard Hauberson,** will be **plant manager of the Muncie** plant.

The **Metal Specialty Company** of Cincinnati has **established** a **unit at Kokomo,** in buildings formerly occupied by Haynes Automobile Company. About 100 men will be employed at first. **The new industry** will make **stamped metal products for radios, refrigerators and automobiles.** Largest back orders in years will enable the **Paranite Wire and Cable Corporation to operate steadily through the winter months,** Col. Paul Seiberling, manager recently said. **New equipment is being installed** to speed production, while more than 100 employees have been added—bringing the total to 400. **General Machinery Company,** Inc. has recently been incorporated **to manufacture at Bluffton, Ind., bread wrapping and slicing machines.**

Vincent Bendix, recently announced that **Radio Products of Dayton, Ohio** is **to be enlarged and remodeled** at an approximate cost of $250,000. **A newly developed radio compass,** used in blind flying, **will be the principal product to be manufactured in the Dayton plant. Combustion Engineering Company, Muncie, now is in production on a new type oil heater of moderate price,** with a generator safety device that prevents explosion or fire in case the burner becomes accidentally flooded with oil. An order for **one thousand of these stoves,** with other smaller orders, has been received. **Alfonso Dix is superintendent** of production. From Indianapolis comes a report that the **Jenkins valveless motor heads now are in production.** The invention is said to **eliminate mechanical valves in automotive engineering** and the product was to be placed on the market November 1 according to officials of **Jenkins Motor Company Inc.** The motor heads are said to be **suitable for cars and trucks** in use today as well as for new motor equipment. **Valves, springs and other parts are eliminated** and a **gas** consumption **saving from 30 to 50%** is claimed. No special timing is required and greatly reduced vibrations are other features of the new type head. A new three-story building is planned by the Link Belt Company in Indianapolis.

Hercules Motor Corporation, Muskegon, Michigan will manufacture heavy-duty internal combustion engines **in a plant formerly occupied by the Clark Sanding Machine Company. Machinery and new equipment is being placed** so that operations can begin as soon as possible. From Pontiac, Michigan we hear **General Motors Truck has the largest single bus order in their history.** The order, it is said, calls fo **350 buses of one type.**

Walker Manufacturing Company, which has been the third largest industry in Racine, Wisconsin had a strike called September 27th, which apparently could not be settled. Walker, accordingly, **bought the old American Gear Company plant at Jackson,** Michigan **and will now do their manufacturing there.** Threats were said to have been made against the company if equipment was moved from Racine.

The Cleveland Trade School of Cleveland, Ohio, sponsored by the board of education, has just opened its fall semester with another large class in Tool Engineering. The ocurse is headed by **Rudolph Fintz,** who is sponsoring a chapter of A.S.T.E. in Cleveland and is chief tool designer of the White Motor Co. The Progress Vacuum Cleaner Co. has been incorporated under Ohio laws and taken quarters at Cleveland, Ohio. At present they are handling the products of Mauz & Pfeiffer of Sluttgart, Germany, but according to Henry A. Kroenlin, president and treasurer, they **will start manufacturing "Progress" cleaners** for domestic use in the Cleveland plant in December or January. The **Winton Engine Corp.** has been awarded a large contract for machinery by the United States Navy. **The Lorain Casting Co.** of Lorain, Ohio, has **awarded contract for a large factory addition.** The Triplex Screw Co. of Cleveland has laid plans for a new warehouse storage building, 90 x 240 feet.

Industrial activity, stimulated by growing production of automotive vehicles, particularly trucks, and of war materials, is rapidly increasing in a number of important European countries, **according to Otto Lundell. A S.T.Eer,** and President of Michigan Tool Company. "It was not unusual to find production schedules for the next six or twelve months doubled over the previous period," Mr. Lundell says. "This is particularly true in the truck field." As to general business in Europe, Mr. Lundell found conditions best in England. Business in France is relatively poor in comparison.

Particularly heavy demand has been experienced for the patented gear manufacturing equipment produced by **Michigan Tool.** As an example an order from a European government has been received for gear lapping machines for the finishing of over 12,000 gears daily.

E D I T O R I A L

For at least, five years, now, "made jobs" of one sort or another, promoted by the Federal and State governments, have tried to relieve the unemployment situation. Before the depression—how were jobs created? A goodly portion of them were the direct result of properly written and well placed advertising. The translation of the virtues of divers products and services into strong effective "copy"—placed before those who are known buyers has and will continue to bring results. Now, you ask, what has this to do with Tool Engineers? Let us finish this theme and we think you will agree that the subject is of prime importance to all readers of this publication.

As sales from advertising increased, more jobs were created. As volume of business grew, for the advertisers, more jobs within their plants were created—more Tool Engineers and all types of practical production men were employed. More raw materials were used, necessitating more men to produce them, and as more goods were sold and shipped by the advertisers more men were needed to transport them, more to handle them at the jobbers or the retailers establishments. All of this increased employment had also the direct result of increasing markets for a multitude of products, and, where mass manufacturing was concerned it meant more jobs and greater opportunities for the mass manufacturing executives or Tool Engineers to which A.S.T.E. and its official publication *The Tool Engineer* are endeavoring to give a professional identity. This is so common in the American economic system that business men, everywhere, take it for granted.

Now, that markets in almost all lines have opened up once more, the opportunity for the shrewd manufacturer is tremendous. He will cash in on *his* opportunity proportionately to the effectiveness of his selling efforts—*in print* as well as by personal solicitation. Many of the manufacturers of machine tools, cutting tools, equipment and accessories used in mass production have and will use *The Tool Engineer* to reach you men who read this publication each month. Many of you are well aware of this and have responded to these messages, but many of you have not mentioned *The Tool Engineer* to these advertisers. *This is something that we hope you will do.* Our advertisers make the publication of this periodical possible. Many of you readers have been and are receiving this publication each month—*free.* In return for this, if you have not yet affiliated yourself with the American Society of Tool Engineers, you can aid its cause by mentioning its official organ to those advertisers from whom you buy.

If advertisers ask you what you think of *The Tool Engineer,* tell them that *you value it, that you read it* and that it is *your paper*—created for you and devoted to the interests of practical mass manufacturing men. By so doing you will aid us to make *The Tool Engineer* even more valuable to you, and at the same time aid yourself.

The METALLURY and FABRICATION of ALUMINUM and its Alloys

By
W. A. DEAN, Ph. D.
ALUMINUM COMPANY OF AMERICA

As given before A.S.T.E.
Detroit Meeting, October 10, 1935

I WONDER how familiar you really are with aluminum? I would guess that you're far better acquainted with aluminum in its various forms than you fully realize. For example, do you think of the tile of the bathroom floor, of the porcelain in the sink, of the brick in your homes as being composed partly of aluminum? Do you realize that the china clay from which your dishes are made, the cement in sidewalks, the very abrasive used to sharpen your tools contain aluminum? I could continue pointing out where aluminum, oftentimes in disguise, is serving you in numerous ways, every day, but I think I have mentioned a sufficient number of applications so you will realize the truth in the statement that aluminum is the most abundant of all the earth's metals. Over 8% of the earth's crust is aluminum, 5% of it is iron and only 0.2% is copper. Of the 92 elements with which we are familiar, only the gas oxygen and the metalloid silicon are found in greater abundance than aluminum.

Bauxite—Occurrence, Mining, Refining

Aluminum exists in ores which may be classified as oxides, silicates, alums, fluorides and hydroxides. We shall be interested in the hydroxides, and in only one of these, Bauxite, because this is the ore from which aluminum is obtained commercially. The ore contains 55 to 60% aluminum oxide or about 30% aluminum, in addition to 5% iron oxide, 10% sand, and 25 to 30% water. It is found in several parts of Europe, principally France, Ireland, the Balkans; in the United States, in Arkansas, Georgia, and Tennessee; in British and Dutch Guiana; and in India.

Bauxite frequently occurs near the surface where it is mined by the pit method after the over-burden has been stripped. The usual procedure is to crush, wash, dry at 200 to 250°F, and pulverize the ore, then calcine it at 1800°, and ship it to East St. Louis, Missouri, where the crude ore passes through an extensive chemical process from which it emerges as a highly refined and concentrated product containing less than 0.1% total of Fe, Si and Ti oxides. The Bayer process, which is the one most commonly used consists of these steps:

1. Drying and grinding to 100 mesh if not done previously.

2. Digesting the bauxite with caustic soda under pressure, at a temperature of 320°F for two to ten hours. The caustic reacts with the ore, forming $NaA10_2$. Iron oxide and most other impurities remain out of solution and form what is known as red mud.

3. Separating the $NaA10_2$ from the undissilved impurities by infiltration.

4. Pumping the solution into large tanks where it is mixed with a seed charge from a previous run. This seed charge facilitates the precipitation of $A1_20_3.3H_20$ which proceeds while the temperature of the solution is dropped very slowly from 300 to 75°F. This operation takes about 60 hours.

5. Filtering, washing and finally calcining the precipitated $A1_20_3.3H_20$ at 1800°F to anhydrous, non-hygroscopic alumina ($A1_20_3$) suitable for electrolytic reduction.

Reduction of Bauxite—Hall Cell

We are now ready to consider the modern method by which aluminum is won from its ore. It was in 1883 that Charles Martin Hall discovered an electrolytic process for obtaining aluminum. He found that cryolite ($NaFA1F_3$) admirably suited his requirements for an electrolyte, for molten cryolite dissolves about 20% of $A1_20_3$ at 1800°F, does not react with the aluminum formed, and has greater electrochemical stability than the oxide.

If a direct current is passed through cryolite containing $A1_20_3$, aluminum will be deposited at the cathode or negative pole, and oxygen liberated at the anode or positive pole. This is the operating principle underlying the present Hall electrolytic cell which consists of a steel box 3′ x 4′ x 7′ lined with carbon blocks 6 to 10″ in thickness—the lining together with a layer of molten aluminum 4 to 5″ thick in the bottom of the tank form the cathode. Above the aluminum layer is a layer of molten cryolite containing $A1_20_3$ in solution and above this a crust of solidified electrolyte through which the carbon anodes project to within 2 to 4″ of the molten metal surface. Aluminum oxide is added to the cell as the electrolyte shows signs of becoming impoverished, thus the process becomes continuous, except when it is necessary to reline the cell, which may be anywhere from one week to three years. The development of the Hall process reduced the price of aluminum from $10.00 to $0.60 per pound almost immediately, and it has gradually dropped to its present level through the application of scientific principles to the refining, fabrication and selling of the metal and its alloys.

Now the Hall process requires a high current at a low voltage. The drop across each cell is from five to seven volts. Since 30 to 100 cells are arranged in series, the generator voltage is liable to be upward of 600 volts. The cells cannot be operated commercially below 8000 amperes, while the usual practice is nearer 30,000 amperes. It requires from ten to fourteen kilowatt hours to produce one pound of aluminum. Let me point out how tremendous these power requirements are. In 1929, The Alumi-

num Co. of America produced 269,000,000 lbs. of aluminum, requiring, at the lower figure for easy calculation 2,690,000,000 kilowatt hours. I think it will be of interest to point out that almost one pound of anode carbon is consumed during the production of one pound of aluminum, consequently The Aluminum Co. of America has become one of the largest, if not the largest producer of carbon electrodes in the world. The electrodes must be of very high purity because as the carbon is burned away, any oxides or impurities present go directly in to the electrolyte, thence to the cathode aluminum.

Now let us return to the cell—the molten aluminum from several cells is ladeled or tapped everyday or so into a holding furnace to obtain large lots of metal with the same chemical composition. Subsequently, the metal, which is of 99.5% purity, is pigged from these holding furnaces. It is possible by means of another process, known as the Hoopes refining process to obtain aluminum 99.99% pure.

Properties of Aluminum

Now that we have a picture of how the metal is obtained, I am going to describe briefly its properties. Aluminum is a white metal with a bluish tinge. With the exception of magnesium and beryllium, aluminum is the lightest structurally used metal. It weighs almost three times as much as water, approximately the same as granite, and is only one third as heavy as steel. It is the third most malleable and sixth most ductile metal. It is not magnetic. Only silver, copper and gold are better heat conductors. Its electrical conductivity is about 65% that of copper on the basis of volume, but over 200% that of copper on the basis of mass. It resists the action of many chemicals, including some acids, but is rapidly attacked by alkalies. Furthermore, it is highly resistant to atmospheric corrosion because of the tenacious oxide film which forms instantly on every freshly prepared aluminum surface. Aluminum of 99.9% purity has a tensile strength of 9000 pounds per square inch, a yield strength of 3000 pounds per square inch, a sheer strength of 7000 pounds per square inch, an elongation of 60%, and a Brinell hardness of 15.

A metal with these properties has a limited number of commercial applications. An example of its use in the commercially pure form is as an electrical conductor. Fortunately however, there are ways of greatly improving the properties of aluminum so that often it is the one material which best meets the requirements of a particular commercial application.

The hardness, strength and fabricating qualities of aluminum are greatly improved by alloying and the mechanical properties of these alloys can be further improved by cold working or by heat treatment. Now every addition to aluminum alters its properties, sometimes favorably, sometimes unfavorably, and it is the job of the research and operating men to so balance the metals added to aluminum that the resulting alloy will be the best composition, from the standpoint of properties and ease of fabrication, which they are capable of producing for the particular purpose the alloy is desired.

In general, those elements which are insoluble in aluminum form alloys not susceptible to heat treatment. The properties of these alloys, however, can be improved by cold working. The alloy known to the trade as 3S is an example of this class. It contains 1.25% manganese and is supplied in the annealed as well as in several hard tempers, representative of which are these:

	Tensile Strength Lb. per sq. in.	% Elongation 2"	Brinell Hardness 500 kg.
3SO	16,000	30	28
3S H	29,000	4	55

The other type of aluminum alloy known as the strong alloy is susceptible to improvement by heat treatment. The susceptibility of an aluminum alloy to heat treatment depends on the fact that aluminum can hold more of an element in solution at elevated than at ordinory temperatures. The following is an example of a high strength aluminum alloy.

25S (A1-Cu-Mn-Si)

	Tensile Strength	Yield Strength	Shear Strength	% El.	B.H.N.
	Pounds per square inch			2"	500 kg.
25S-W	48,000	25,000	30,000	18	80
25S-T	58,000	35,000	35,000	20	100

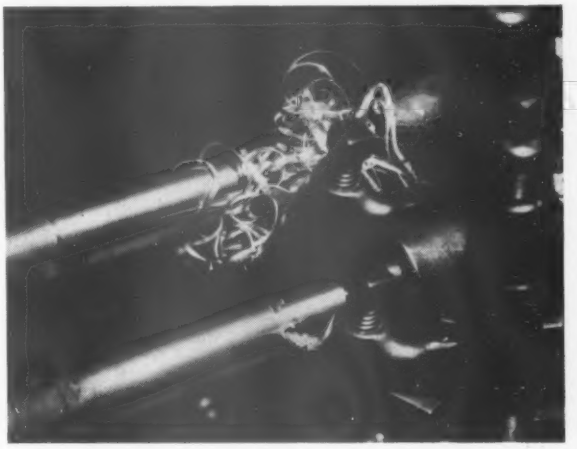
I haven't told you all there is to the heat treatment of aluminum alloys, but I think it will suffice to give you an understanding of the fundamental principles.

Now let us proceed to the fabricating and casting processes whereby these alloys are transformed into useful objects.

Rolling

Ingots for rolling into sheet are cast weighing from 10 to 3000 pounds. The sheet is strip rolled to 36 gage (B. and S.) that is, to 0.005". From this point on it is called foil. Aluminum is rolled down

Test Set-Up for Determining Cutting Characteristics. Non-free cutting aluminum alloy (upper) and free cutting aluminum alloy (lower). Lathe cutting tool is used on ¾ in. stock.



to a thickness of 0.00025". This foil finds a wide number of applications in house insulation, body and truck insulation, wall paper, for wrapping food, candy, etc., and for sealing bottles. Large flat sheet can be rolled up to a width of 144 inches. The flat or coiled sheet is drawn, spun or stamped into articles too numerous to mention in any detail—examples are cooking utensils, furniture, cans and containers of various sorts, railroad and truck car sides and roofs, oil tanks, and beer barrels. Aluminum sheet may be cupped into tubing blanks and used for mail tubes, gasoline pumps, or oil lines. Sheet also is hammered into powder from which aluminum paint is made.

Rod and bar stock is drawn up to 8" in diameter or as rectangles up to 4" x 10". Wire is drawn from some of this rod down to a diameter of 0.005. This wire is stranded, often around a steel center core and used for electrical conductors. The longest high tension line in the world is aluminum—it carries 232,000 volts. Other wire and rod is supplied to the screw machine trade. Structural shapes such as angles, Z's, channels and I beams also are rolled.

Forging

Not only do aluminum alloys find a wide variety of uses in the rolled form, but aluminum alloy forgings are constantly meeting the requirements of an ever expanding field of applications. Aluminum forgings have played a vital part in the rapid strides made by the aeroplane industry in the last few years—propellers, some of them 15 feet long and weighing 130 pounds, pistons, crankcases and nose pieces are examples of aeroplane forgings. Probably the complete set of locomotive connecting rods weighing 1300 pounds were the largest forgings ever made.

Extruding

Now there's one more widely used fabricating process that should be mentioned, namely, extrusion. A wide variety of very intricate shapes are extruded, and used for auto and truck trim, railings, decorative work, store fronts, etc.

Sand Casting

Although aluminum alloys are widely used in the wrought form, a far greater tonnage goes annually into the production of sand, die and permanent mold castings. Aluminum alloys are widely cast in green or wet sand molds as well as in dry or core sand molds.

Several unusual sand castings might be mentioned as: aeroplane cylinder heads, spandrels some of which are 6 feet square, 3/16 to 1/4" thick and weigh over 125 pounds, steam shovel parts, and even Diesel cylinder blocks. Probably the largest sand casting was a Diesel cylinder head weighing 7500 pounds finished. That means that about 15,000 pounds of metal were melted and cast into the mold.

Permanent Mold Casting

Aluminum finds many uses in the permanent mold casting field, from washing machine agitators to automotive cylinder heads and pistons. Permanent mold castings are poured at atmospheric pressure into iron or steel molds. Because of the more rapid solidification, permanent mold castings are more susceptible than sand castings to improvement by heat treatment. Where the permanent mold process is applicable it offers certain mechanical advantages and close dimensional tolerances, hence finishing costs are low.

Die Casting

Aluminum alloy die castings have the advantage of lightness, corrosion resistance, and permanence of dimensions, compared to some of the other metals used for die castings. In the die casting process the metal is forced into the steel mold cavity or die under a hydrostatic pressure usually in excess of 100 pounds per square inch.

Die castings are liable to be porous, consequently they should not be recommended where strength is a prime factor but where a part must be made in large numbers and cheaply—where close dimensions and pleasing surface are required without resort to a finishing operation, where strength is relatively unimportant—the answer is very likely to be a die casting. Examples of die castings which are encountered frequently are: automobile carburetors, brake shoes, brackets, housings, cases, frames for instruments, radio parts, etc.

Welding

A dicussion of the fabricating and casting of aluminum alloys would not be complete without the mention of a very commonly used auxiliary process, welding. Aluminum alloys can be torch welded successfully under a wide variety of conditions. For thin sections, less than 1/8", the oxy-hydrogen flame gives better results, while for thicker material the oxy-acetylene flame is preferable.

The arc welding of aluminum is somewhat of a recent development. Arc welding is applicable where it is undesirable to heat large areas on either side of the weld. The metallic arc is satisfactory for thicknesses greater than 14 gage (.064), while for thinner material the carbon arc produces better results. Aluminum alloys also may be butt and spot welded.

Machining—Free Cutting Aluminum Alloys

I've covered the production of aluminum, as well as the various fabricating and casting processes by which the aluminum alloys are transformed into objects useful to man. Now I'm going to tell you of a very recent development—a free cutting aluminum alloy. Furthermore, I want to describe some of the machining characteristics of aluminum and finally point out where aluminum alloys can be applied to the construction of your machines.

Those of you who are familiar with the machining of 17S-T and other aluminum alloys have probably encountered at one time or another, long, voluminous chips that fouled the tools and work, making it necessary to frequently stop the machines for cleaning. A large chip is always a nuisance because it takes up valuable space in the bottom of a screw machine and adds to the difficulty of separating the stock from the turnings. There is a very interesting story connected with the development of the new free cutting aluminum alloys but time will not permit its telling in any detail. Suffice to say that as

the result of considerable research, several elements were found which markedly improved the machining of the aluminum alloys to which they were added. Representative of this class are lead and bismuth. As the result of further experimenting, it was thought that an aluminum-copper alloy containing lead and bismuth, now called 11S, had the best opportunity of meeting the requirements of a commercial screw machine material. This alloy can be cast into ingots with but a slight modification in our standard practice, it can be fabricated without difficulty, it is susceptible to improvement by heat treatment, consequently it can be supplied with a wide range of properties. In the T temper (fully aged) its properties are comparable to those of free cutting brass. Furthermore, it has machining characteristics similar to brass.

Now for a brief description of the machining of aluminum. Most men, familiar with the machining of metals have a considerable background in cutting steel and brass, consequently I shall try to point out wherein aluminum machines similar to these metals and wherein its cutting characteristics differ. Tools used for machining free cutting brass have little if any top or side rake—they are ground on fairly coarse wheels and may be used without a cutting compound or with one having a paraffin base. Tools prepared to machine steel have somewhat greater rake and side angles, are ground on a medium wheel and often used with a soluble oil cutting compound. The proper tools for cutting the aluminum alloys ordinarily encountered should have fairly large rake and side angles, should be ground on a fine wheel followed by hand stoning. A cutting lubricant composed of about equal parts of lard, oil, and kerosene is usually satisfactory. Now the newly developed free cutting aluminum alloys have somewhat different cutting characteristics than other aluminum alloys. Our experience has been that these alloys machine best with tools having cutting angles similar to those used for machining steel and in some screw machine applications it has been possible to machine the free cutting aluminum with tools ground for brass. This is a significant difference since it means tools for free cutting aluminum have larger total cutting angles, consequently, more metal backs up the cutting edge, the tool operates at a lower temperature and its life is materially prolonged.

We have been able to cut this new material in general at the same feed, speed, and frequently with the same lubricants, commonly employed for brass —although in a few cases it has been necessary to reduce the feed.

Those of you who visited the recent Machine Tool Show at Cleveland will be interested in knowing that some of the housings, levers and moving parts, particularly on the smaller machines were aluminum alloy castings. Aluminum has been found applicable to many parts of machines that have to be moved by man or motor. There is a very definite trend towards the wider application of aluminum to parts of machinery, not only because power is conserved, but in modern machines the inertia of the parts is an important factor in determining the speed with which they can be moved—lighter materials mean less inertia and greater speed.

Royal Holt, genial A.S.T.Eer President of the R & M Manufacturing Company, Detroit has been elected to the Presidency of the Gage Manufacturers' Association. This body comprises the important and leading gage manufacturers of the country. Congratulations Mr. Holt.

CLEVELAND MEETS TO FORM A.S.T.E. CHAPTER

The first meeting of tool engineers in the Cleveland district to consider formation of a local American Society of Tool Engineers chapter was held in the Cypress Room of Hotel Hollenden on Friday evening, October 18. Approximately forty interested persons were in attendance. Others, who could not be there, sent their regrets.

Rudolph Fintz, chief designer for the White Motor Co., who has been working hard in the interests of a new chapter here, opened the meeting and explained its purpose. He introduced Ford R. Lamb, First Vice President of the American Society of Tool Engineers, who had come down from Detroit to aid in the organization.

Mr. Lamb gave a capable outline of the A.S.T.E., its aims and policies, with a history of the foundation and the rapid progress of the past three years. The peculiarities and needs of the tool engineer and his place of importance in the industrial world were discussed. Mr. Lamb further explained the meetings of the organization, the development of personality and good fellowship, discussions on problems of mutual interest, and the general benefits accrued.

A.S.T.E. Charters Chapter At Racine

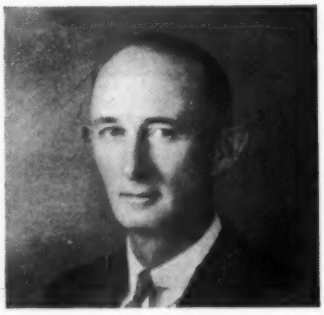
Members of the American Society of Tool Engineers, everywhere, will be pleased to learn of the chartering of a new chapter at Racine, Wisconsin on October 21st.

Some months ago a reader of *The Tool Engineer*, Mr. Eugene Bouton of the J. I. Case tractor works at Racine, undertook the work of organizing a local group with the intention of applying to A.S.T.E. headquarters for a chapter. After some correspondence on the subject with A.S.T.E. headquarters in Detroit, Mr. Bouton obtained membership applications from a number of Tool Engineers in the Racine area and advised the Secretary's office that he was ready to go ahead with the charter.

By vote of the Board of Directors R. M. Lippard, A.S.T.E. President and A. M. Sargent, A.S.T.E. Secretary were authorized to go to Racine to formally install and charter the newly formed chapter. A meeting had been called by the Racine group for Monday Evening, October 21st, and the A.S.T.E. officers arrived in time to officiate at the formal ceremonies.

Mr. Lippard and Mr. Sargent arived in Racine on the morning of October 21st and were met by Mr. Bouton who kindly escorted them around various plants in the Racine area, where they met many of the new members and friends of the Racine group. The meeting which had been called for that evening was held at a local hotel and was well attended. Much enthusiasm was apparent. The new members expressed pleasure in affecting the organization of the new chapter and almost universally expressed their need for an organization for practical manufacturing executives such as A.S.T.E. As President of A.S.T.E. Mr. Lippard presided. He gave an outline of the aims of A.S.T.E. and explained some of its purposes and why it was first organized. Mr. Sargent explained the routine workings of the organization and went into the details of how the books of the new chapter should be kept, the finances, etc.

An election of officers was then held with the following results; H. D. Hiatt, Tool Supervisor, The Nash Motors Company, Chapter Chairman, Herbert C. Falkenrath, Superintendent, Racine Screw Works, Treasurer and J. A. Elwood, Superintendent, Nash Motors, Secretary. Among newly elected members were the following: Eugene Bouton, Theodore Colby, T. R. De Roche, Leo A. Dumser, J. A. Elwood, Herbert C. Falkenrath, Hollis H. Gordon, H. D. Hiatt, Arthur M. Kellam, Robert H. Libke, Charles C. Merrill, L. E. Phelps, Wm. E. Quirk, T. J. Santry, Milton J. Schmitt, Emil Schneebeli, Clem J. Schroeder, C. J. Schweitzer.



H. D. HIATT,
Chapter Chairman, Racine Chapter

H. C. FALKENRATH,
Treasurer, Racine Chapter

J. A. ELWOOD,
Secretary, Racine Chapter

The highlight of the evening was the formal presentation of the A.S.T.E. Charter to the group. A note of optimism was sounded by all speakers for the newly organized group, and an excellent response was given by Mr. Hiatt.

An informal meeting of the Racine Chapter Officers and Mr. Eugene Bouton and Mr. H. V. Gordon, Charter Members who have been instrumental in forming the new chapter, was held October 28th. Committees were selected for the new chapter covering Membership, Industrial Relations, Constitution and By-Laws, Meetings and Publicity.

November 18th has been tentatively set for the next Racine Chapter Meeting, which will probably be held at the Hotel Racine.

For All Members to Read

Members and friends of Arnold Olson, former A.S.T.E. Tool Engineer of the Kelvinator Corporation, whose decease was announced in the April 1935 issue of *The Tool Engineer*, should be advised that his widow, Mrs. Grace Olson, is in need of employment. Her experience covers billing, filing, phone ordering, tracing, detailing and general office routine.

Anyone knowing of a position or in need of such services should get in touch with *The Tool Engineer*, or direct to Mrs. Olson at 14896 Dolphin, Detroit, Michigan.

P A T E N T S

INAUGURATING A SERIES, PRESENTING A CONCISE INFORMATIVE GUIDE ON A SUBJECT OF UNIVERSAL INTEREST TO THE INDUSTRIAL EXECUTIVE

By EVERETT G. WRIGHT
PATENT ATTORNEY
DETROIT, MICHIGAN
Member of the Michigan, Federal and Patent Bars.

What is a Patent? A patent is a means for the protection of industrial property rights in an invention comprising a grant by the government to the inventor, his heirs or assigns, of the exclusive right to make, use and vend the invention for a period of seventeen years within the United States and its Territories, all in consideration of a complete disclosure of the invention to the public by the inventor.

The Patent Grant. The patent itself consists of four parts:

(a) The grant from the government which is the formal contract between the government and the inventor.
(b) Drawings illustrating the invention if the invention admits of it.
(c) A specification completely describing the invention and explaining the drawings.
(d) A claim or plurality of claims which define the scope or quantum of the patentable invention granted to the inventor.

Constitutional Authority. Article 1, Section 8 of the Constitution provides that "Congress shall have power . . . to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

Statutory Provisions. In pursuance of the constitutional authority vested in it, Congress has enacted laws regulating the granting of patents.

Section 4886 of the Revised Statutes of the United States, as amended May 23, 1930, is the principal enactment relating to utility patents now in force and is as follows:

"Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, or who has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuber-propagated plant, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor."

The word "patent" generally refers to a utility patent as may be granted under the above quoted statute. The term of a utility patent runs for seventeen years from the date of its grant.

Subject Matter of Patents. The statute provides that patents may be granted for arts, machines, manufactures, compositions of matter and plants.

Interpreting the statute, and "art" is a process or method of treating certain materials in a definite manner so as to produce a particular result or product.

A "machine" is a unitary combination of machanical parts, so arranged as to receive energy and perform a useful operation and/or produce a desired result. The machine as a unitary combination or any sub-combination of the machine or parts thereof or any improvements therein are subject to patent protection.

A "manufacture" includes everything that is made by or at the instance of man except those things that may be patented as machines, compositions of matter, processes or designs.

A "composition of matter" covers all mechanical and/or chemical unions of two or more substances, whether they be solids, powders, fluids or gases, which result in composite articles.

In addition to coming within the statutory classes of inventions, the process, machine, manufacture or composition of matter must pass the tests of invention, novelty and utility before rising to the dignity of being a proper subject of a patent.

Plants, being easily distinguished from other classes of patentable inventions, have been excluded from the above interpretation of statutory subject matter of utility patents.

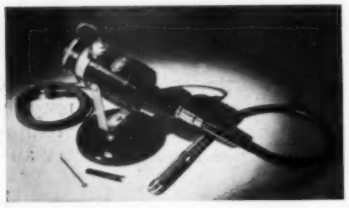
Persons Entitled to Patents. Patents may be applied for by inventors or joint inventors, the executor or administrator of a deceased inventor, and the guardian or representative of an insane inventor. Employees of the United States Patent Office are prohibited from filing applications for patents.

Design Patents. A design patent provides protection for any new, original and ornamental design for an article of manufacture. The term of a design patent runs for a period of three and one-half, seven or fourteen years; the applicant having the right to select the duration of the term.

Trade-Marks. Federal trade-marks are those used in interstate commerce, foreign commerce or in commerce with Indian tribes, and are registerable in the United States Patent Office and remain in force for a period of twenty years, subject to renewal from time to time upon payment of fees required by law. There must be an interstate shipment of goods having the trade-mark thereon or appended thereto in order to establish a basis for a federal registration of the same. *(To be continued)*

NEW EQUIPMENT

Dumore K. G. Vari-Speed Flexible Shaft Tool

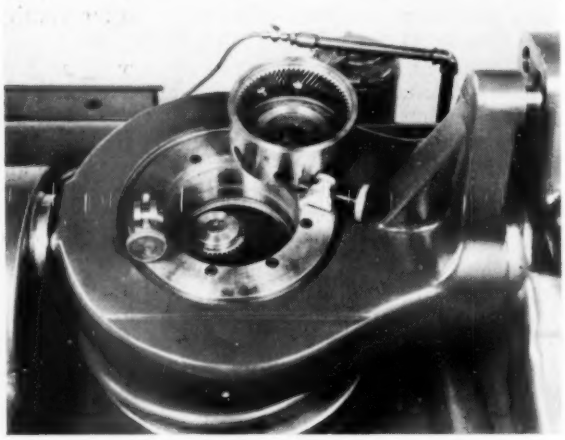


A recent development of the Dumore Company, Racine, Wisconsin, is the Dumore K. G. Flexible Shaft Tool with governor control. A speed range of from 1700 up to 12000 R.P.M. can be easily had, yet the tool at all times delivers its full ¼ H.P. The tool was designed for tool makers, pattern makers and other workers in metal and wood. Increased production is claimed for the tool because of its flexibility and the wide range of work it can handle replacing cumbersome shaft and hand tools. The tool is priced at $110 f.o.b. Racine.

Jones Universal Magnetic Jig Blocks

Popular demand on the part of the trade has brought about the production of various shapes of magnetic jig blocks by the Barker Tool Die and Gage Company of Detroit. Standard angles, Vees, parallels and verticles are now carried in stock for prompt delivery. These blocks are cast from selected alloys of non-magnetic separator material and conductor bars in convenient sizes to readily make angles and odd shapes that will grip work in proper relation to chuck surface.

Michigan Tool Gear Finishing Machine



Detail of the new Michigan Tool Company, Detroit, Michigan, internal gear finishing machine. It operates on the same crossed axes principle as the Michigan Tool rack types of finishers for spur and helical gears. Note the eccentric mounting of the cutter which moves back and forth slowly over an arc while rotating. The machine is usuable for large variations in gear sizes by simply changing the ring adapter.

Bullard Roto-Broach

The Bullard Company, Bridgeport, Connecticut, now offers to the manufacturing world the Bullard 12-Spindle Contin-U-Matic equipped with internal and external Roto-Broach.

In some instances the Roto-Broach cutter blades may be arranged to pass tangentially of the periphery of the work. In other instances a circular series of blade edges may enter internally or surround externally a circular work piece to accomplish turning of either interior or exterior surfaces. These surfaces may be in a single plane or several planes, or to better illustrate, there may be several diameters including angles or radii, the cutters conforming in design to the requirements. The blade edges are preferably in parallel, and each blade has a decided clearance angle, thereby avoiding undue heating and friction. Also, each blade preferably includes an angular rake surface which may terminate in a well rounded or circular surface so as to properly discharge chips without undue strain or distortion.

By the use of this type of tool, it is possible to provide maximum tool life, since the burden on each blade may be relieved by the fact that the work is being operated upon by as many roughing cutters as may be required, and as many finishing cutters as may be required, all in a single pass of the tool. No one blade will thus be subjected to continuous action or over-burdening by too deep a cut. Furthermore, from a single chucking of the work, the tool will operate to both rough and finish the work at a single pass of one tool block.

Ingersoll Zee Lock Core Drills and Reamers

The Ingersoll Zee Lock Cutter Blade has now been applied to multi-blade boring tools. It forms an adjustable and renewable inserted blade core drill or reamer. The cutters may be reground to size by inserting the Zee Lock Cutter Blade in the next slot, which moves out the blade only part of a serration, minimizing the amount of regrinding to size. There are eight to thirty-six adjustments or resizings possible with one set of blades. They are made either with shank or of shell type for use on separate arbor. The coarsely spaced blades in the core drills are set with rake and shear for free cutting. Ingersoll Zee lock Reamers are also made either shank or shell type, only they have more blades which are set straight or with negative shear angle and irregularly spaced. Other special boring tools are made with special piloting body designs or in combination with other boring, facing, and hollow milling tools.

Thomas Prosser & Son Announces Detroit Sources for Widia Cemented Carbide Tools

The following Detroit tool manufacturers are now in a position to furnish the tools of their manufacture with Widia Cemented Carbide: Brown-McLaren Mfg. Co., Detroit Boring Bar Co., Eclipse Counterbore Company, Gairing Tool Company, Giern & Anholtt Tool Co., Lincoln Park Tool & Gage Co., National Twist Drill Co., Production Tool Co. of Am. Tungston Carbide Tool Co. (Division of Michigan Tool Co.) The Detroit office of Thos. Prosser & Son can make immediate delivery from Detroit stock Widia tips in all grades and in any shape desired.

Milling Clutch Parts On Hydraulic Rigidmil

The Sundstrand 3-Spindle Rise-and-Fall Rigidmil, shown in Fig. 1, was built to order for performing a series of operations successively on clutch hubs. Machine has a heavy base on which are mounted three large columns. Work table, which has automatically hydraulic operating cycle, slides on vertical ways accurately machined on one column. Three spindle-heads; each with independent motor drive, pick-off gears for spindle speed changes, and rigid outboard spindle bearing; are adjustably mounted on the columns. A variety of different sized clutch hubs are milled, five of which are shown in Fig. 2. Some of the operations require one cutter on each spindle others two, the latter set-up being shown in Fig. 3. Production on these operations is high, price of machine and operating cost low. Rigidmils of this or similar types can be used to advantage for cutting costs, increasing production, and saving floor space in machining clutch plates or other parts on which radial milling operations are necessary.

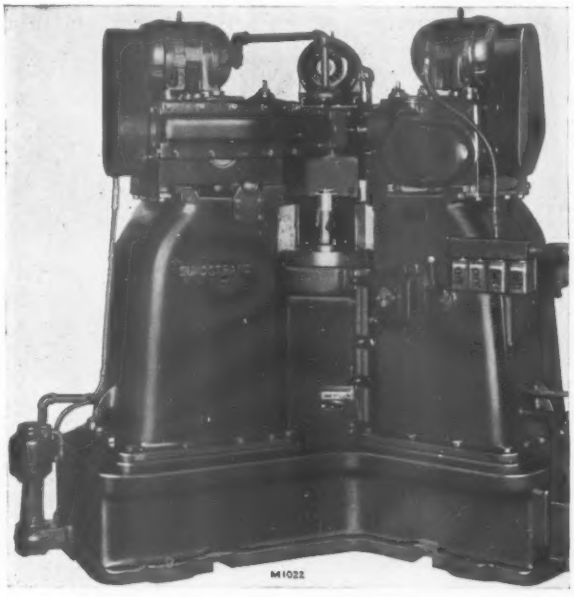


Fig. 1—3-Spindle Hydraulic Rise-and-Fall Rigidmil for clutch hubs.

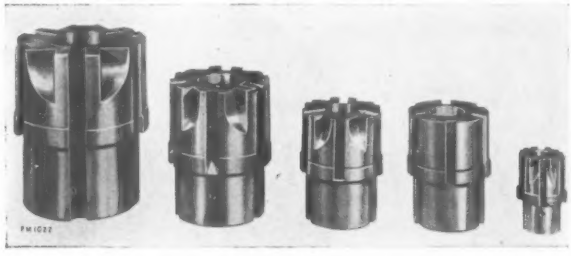


Fig. 2—Some of the clutch hubs Rigidmiled.

Fig. 3—"Airplane" view showing arrangement of spindle heads and cutters.

Applications of Sundstrand standard, semi-standard, or completely built-to-order Rigidmils are practically unlimited. These machines can have any desired number and arrangement of spindles; manual, mechanical, or hydraulic feeds; simple or complex automatic operating cycles; mechanical or hydraulic indexing and work-clamping. They can be arranged for single, multiple, or progressive milling operations. Consult us, today, about possible applications of Sundstrand Rigidmils on your work. Reliable recommendations and estimates will be submitted promptly, without charge.

THIS MONTH'S COVER

PRECISION THREADS CAN NOW BE PRODUCED ON A PRODUCTION BASIS

The production of precision ground threads has presented a difficult manufacturing problem during recent years. Many methods have been tried for producing this type of threads, none of which offered a satisfactory solution. Considerable difficulties were encountered due to the distortion of the parts when they were heat treated. When the parts were finished by any of these methods it was necessary to increase the tolerances to such an extent that it was impractical to maintain the necessary close fit between the mating parts.

The increasing demand for greater accuracy on aircraft and marine engine studs, Diesel engine parts, gauges, taps, chasers, worms, lead screws, transmission parts, electric drills, oil burners and similar threaded parts has been responsible for the development of the Ex-Cell-O Precision Thread Grinder. This grinder was mentioned in the article, "Over Fifty Thousand Attend Machine Tool Show," in the October issue of *The Tool Engineer*, as being the first American made commercial thread grinder to be offered for sale to the American manufacturers and exhibited at the recent Machine Tool Show in Cleveland.

This grinder has been in the development stage and in operation for the past five years on all types of special production precision work in addition to the regular production work in the Ex-Cell-O plant. Several of these early models were sold to manufacturers for grinding taps. The development of this precision thread grinder, it is felt, represents a marked progress in the production of threads requiring uniform accuracy after heat treating.

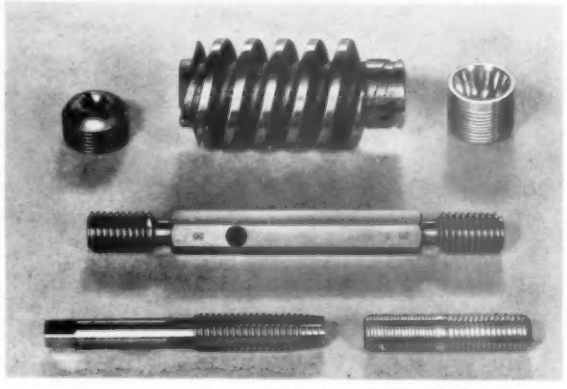
The outstanding features of this grinder according to the builder are: the ability to grind threads from the hardened or heat treated solid blank; ability to hold a lead tolerance not to exceed .0002" per inch; pitch diameters on work up to one inch held to a .0002" tolerance with an additional .0002" for each additional inch diameter; on coarse threads to permit finish grinding of threads that have been rough cut before heat treating, and a thread grinding oil used as coolant.

A maximum diameter of five inches and a length of 18 inches can be held between the machine's centers. A threaded portion up to eight inches in length can be ground on the eighteen inch length. By the use of oil as a coolant an 18 inch diameter grinding wheel is used which can be swiveled in a vertical plane to a maximum of 15 degrees in either direction to suit the helix angle of right or left hand threads.

The wheel spindle and the work drive spindle are mounted in Ex-Cell-O Precision Developed Ball Bearings that have a maximum end play not to exceed .00015" under a reversed axial load of 20 pounds while running. These bearings, which were especially developed for precision applications where definite control of radial and end thrust is imperative, have been in constant use on precision grinding and boring applications for many years. By their use it is possible to obtain the unusual accuracy for which this machine is noted.

The complete machine is modern in appearance, compact in design, of rigid construction, and is self contained. It is equipped with a coolant pump, motor and tank in the machine base. Diamond wheel dresser, back-off attachment, work positioning and backlash devices are provided on this machine.

It is now possible with this grinder to grind parts to exact size after heat treating and show a favorable comparison insofar as costs and quality of work are concerned.



A group of threaded parts that require unusual accuracy for their operation. Each of these parts were finish ground on the Ex-Cell-O Precision Thread Grinder from the hardened blank except the large worm at the top which was rough ground, hardened and then finish ground. The worm has a double left-hand thread with a hardness of approximately 52 Rockwell on the "C" scale.

At each end of the worm is a valve clearance adjusting screw made from bar stock with a hardness of approximately 60 Rockwell. The threads are ground as the last operation on each screw. In the center of the group is a go and no go thread gauge that requires unusual accuracy and finish. It must have the proper hardness to eliminate excessive wear in use.

A ground tap is illustrated at the lower left and a stud at the lower right of the photo. Both parts were ground from the hardened blank, holding close limits and a high finish.

TRYING TO LOCATE THAT "SQUEAKY" SPRING

You can't hear a die spring "squeak," you say?

Possibly not, but inferior springs—or springs not adapted to their job—fairly SHRIEK from fatigue. Shortly they BREAK. The resulting lost time is costly—and unnecessary.

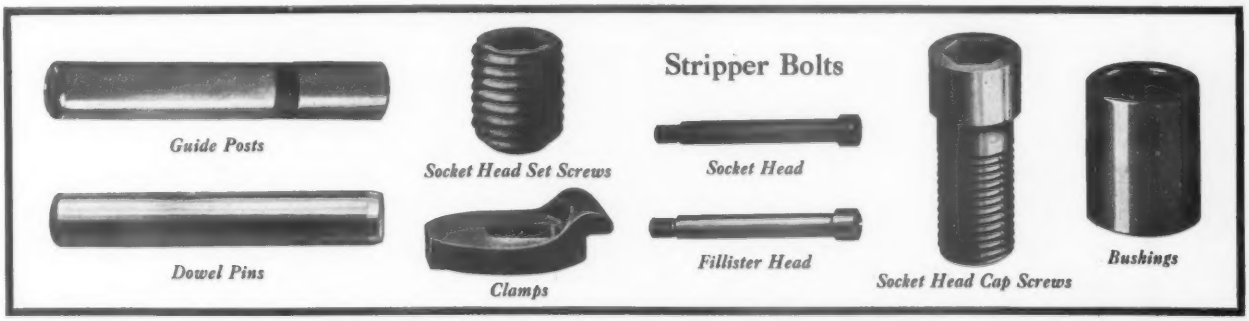
HOW TO SECURE LONGER DIE SPRING LIFE

Flat Rounded Spring

Select your die springs from the chart in your Danly Catalog. You'll find exactly the "Standard" or the "Special" springs that your work demands. Danly Die Springs *last longer*. They are made of Silico-Manganese Steel, carefully heat treated and hardened after coiling. They are made Flat-Rounded or Square for Pressure-Pad, Knock-Out and Stripper Plate service.

And when you order Danly Die Springs, remember that Danly Guide Posts . . . Bushings . . . Clamps . . . Dowel Pins . . . Socket Head Cap and Set Screws . . . Stripper Bolts and Precision and Commercial Die Sets are quality Die Makers' Supplies, too. They are stocked in all branches for immediate delivery.

See your Danly Catalog for prices and discounts or send your requirements to the nearest Danly branch office plant.



DANLY MACHINE SPECIALTIES, Inc., 2114 South 52nd Ave., Chicago, Illinois

BRANCHES:

Long Island City, N. Y., 36-12 34th Street
Dayton, Ohio, 114-116 N. St. Clair Street
Detroit, Mich., 1549 Temple Avenue
Rochester, N. Y., 16 Commercial St.
Cleveland, Ohio, 1444 E. 49th Street
Philadelphia, Pa., 3913 N. Broad St.

DANLY DIE MAKERS' SUPPLIES

CLEVELAND FORMING A.S.T.E. CHAPTER

(Continued from page 13)

This was followed by an outline of chapter requirements and the reading of resolutions and by-laws.

A lengthy forum was held during which qualifications for membership, dispersement of dues, elections, official duties and other matters were taken up.

Mr. Fintz called for a vote as to how many were ready to file their applications for membership that night. Several were ready but the number did not reach the required 25 necessary for a charter. A second vote was taken as to how many were interested in the question of a Cleveland chapter. The response was one hundred per cent and, with this demonstration, it was considered fairly certain that a charter group would be recruited within the next few weeks. Some signed up for membership in A.S.T.E. immediately following the meeting but most of those present wanted more time to consider the step after having received their first comprehensive knowledge of the organization. Considerable enthusiasm was displayed by those who remained to discuss details.

All those present at the first Cleveland meeting registered their names and addresses for further notices and each person in the room took two application blanks for possible use. Rudolph Fintz and other leaders in the movement here are planning to continue work and another meeting is expected to be called soon. At that time it is expected that a charter will be applied for.

Advertisers in *The Tool Engineer*, this publication and The Society it represents will appreciate the mention of this publication when replying to advertisements herein.

Index of Advertisers

GRINDING COSTS REDUCED WITH EX-CELL-O CARBIDE TOOL GRINDER

A positive way to duplicate the original tool life per grind on tungsten and tantalum carbide tipped tools after they have been placed in service is to maintain the same rake and clearance angle with a sharp and smooth cutting face.

The Ex-Cell-O Carbide Tool Grinder using diamond impregnated wheels is designed to duplicate tool shapes, cutting edges and surfaces of turning, facing and boring tipped tools as originally furnished by tool manufacturer.

EX-CELL-O AIRCRAFT & TOOL CORPORATION

1204 OAKMAN BLVD. • • • DETROIT, MICHIGAN

FREE . . .

upon request

55 Diversified Applications . . . demonstrated by 33 Leading Machine Tool Builders at the Cleveland Show

You'll Want This 20-Page Record of Carboloy Performance on New Machine Tools

Just off the press—a 20-page booklet giving complete records of Carboloy performance on 55 new machine tools demonstrated at the Machine Tool Show. "Live," up-to-the-minute data about Carboloy tool use on a diversity of metals, machines and operations featured by 33 leading machine tool builders. A limited supply is now being distributed to production executives interested in reducing machining costs through the use of Carboloy cemented carbide.

CARBOLOY COMPANY, INC.

CHICAGO DETROIT PITTSBURGH
CLEVELAND NEWARK PHILADELPHIA

CARBOLOY

Reg. U. S. Patent Office

CEMENTED CARBIDES

The Mark of CARBOLOY
REG. U. S. PAT. OFF.

Mail Coupon for Your Copy

Carboloy Company, Inc.
2983 E. Jefferson Ave.
Detroit, Michigan

Send us your free 20-page booklet describing 55 Carboloy Applications demonstrated at the Machine Tool Builders' Show.

Name_____ Title_____

Company_____

City_____ State_____